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F2G

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(54) Strap tightener with strap lock

(57) Strap tightener comprises an element 10 for fixedly anchoring the strap tightener, an operating arm 19 pivotally mounted to the anchoring element 10, a strap drum 15 mounted co-axially with the pivot axis, at least one ratchet-wheel 23 connected to the drum for rotation therewith, a catch pawl 25 mounted to the anchoring element 10, and a drive pawl 24 mounted to the operating arm 19, the pawls both being spring-biased to engage the ratchet-wheel 23. The operating arm 19 is drivingly connected to the drum 15 by means of the drive pawl 24 and the ratchet-wheel 23 when swung in one direction and is disengaged from the drum 15 when swung in the opposite direction. A cam element (49, Fig. 4) is arranged on the operating arm for operating the catch pawl to the disengaged position against the spring bias when the operating arm is being swung beyond a predetermined angular position. On the anchoring element 10 a strap lock 37, 38 is arranged for the strap extended to the drum 15, comprising a spring-biased movable clamping jaw 38 for locking the strap against withdrawal from the strap tightener. The operating arm 19 is adapted to engage operatively the jaw at continued swinging movement in the driving direction beyond a second predetermind angular position to operate the jaw to disengaged position while the strap being released from the strap lock to allow withdrawal of the strap from the strap tightener.

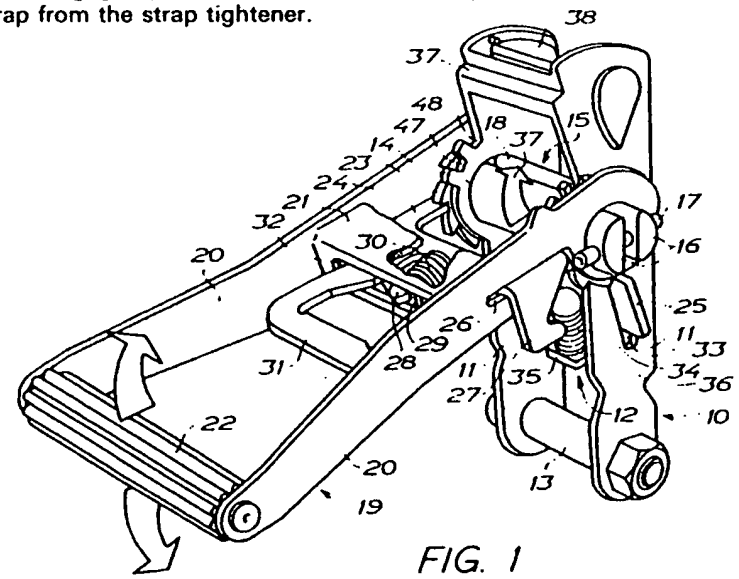

FIG. 1

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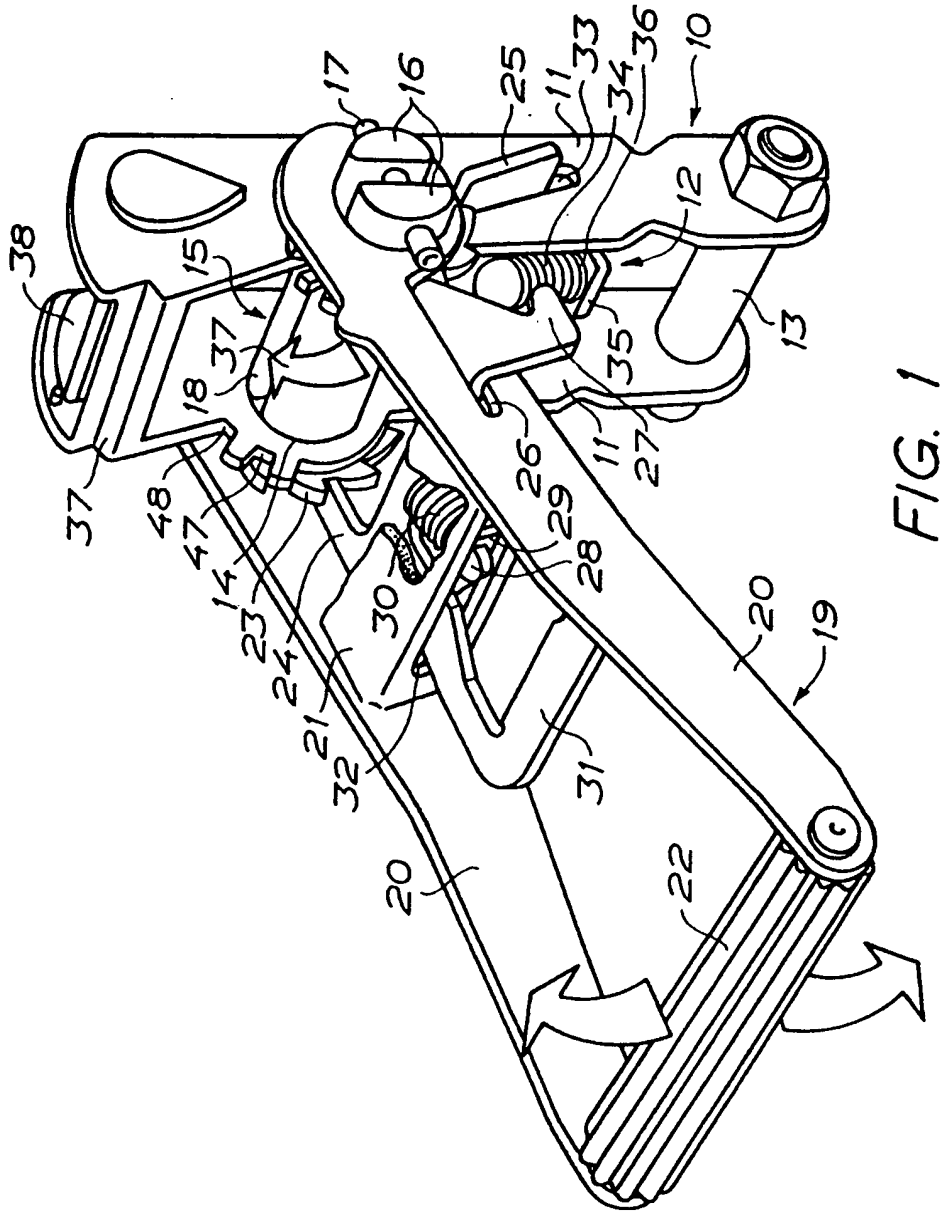
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FIG. 1

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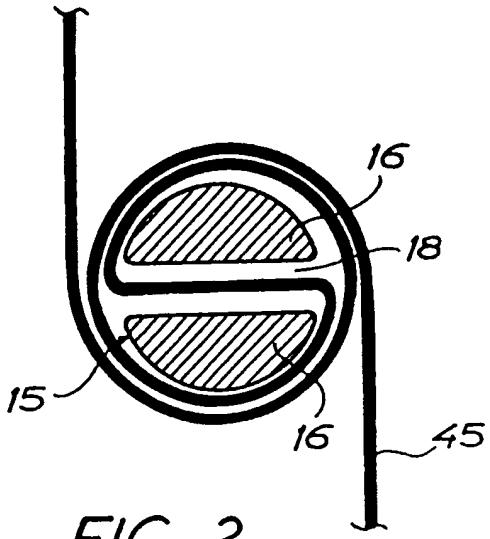

FIG. 2

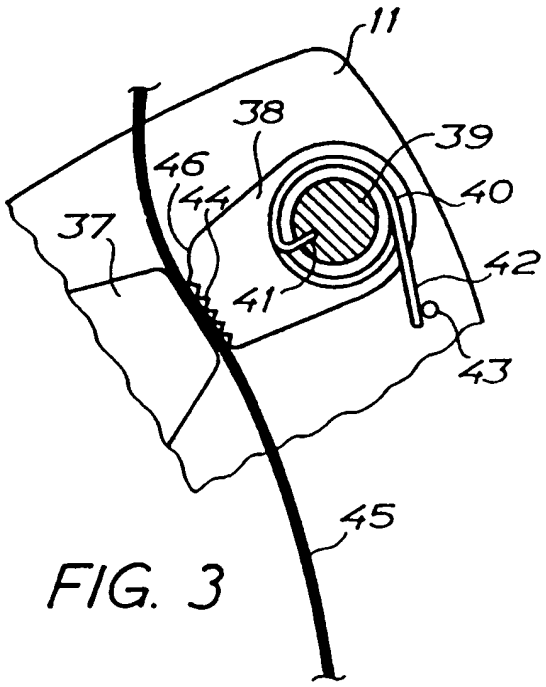

FIG. 3

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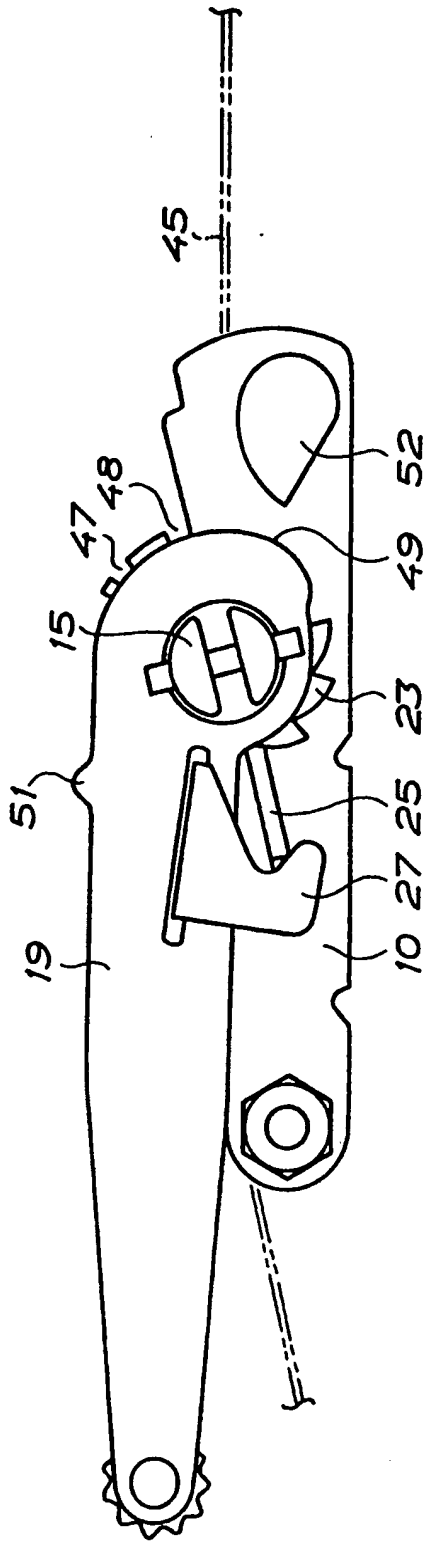

FIG. 4

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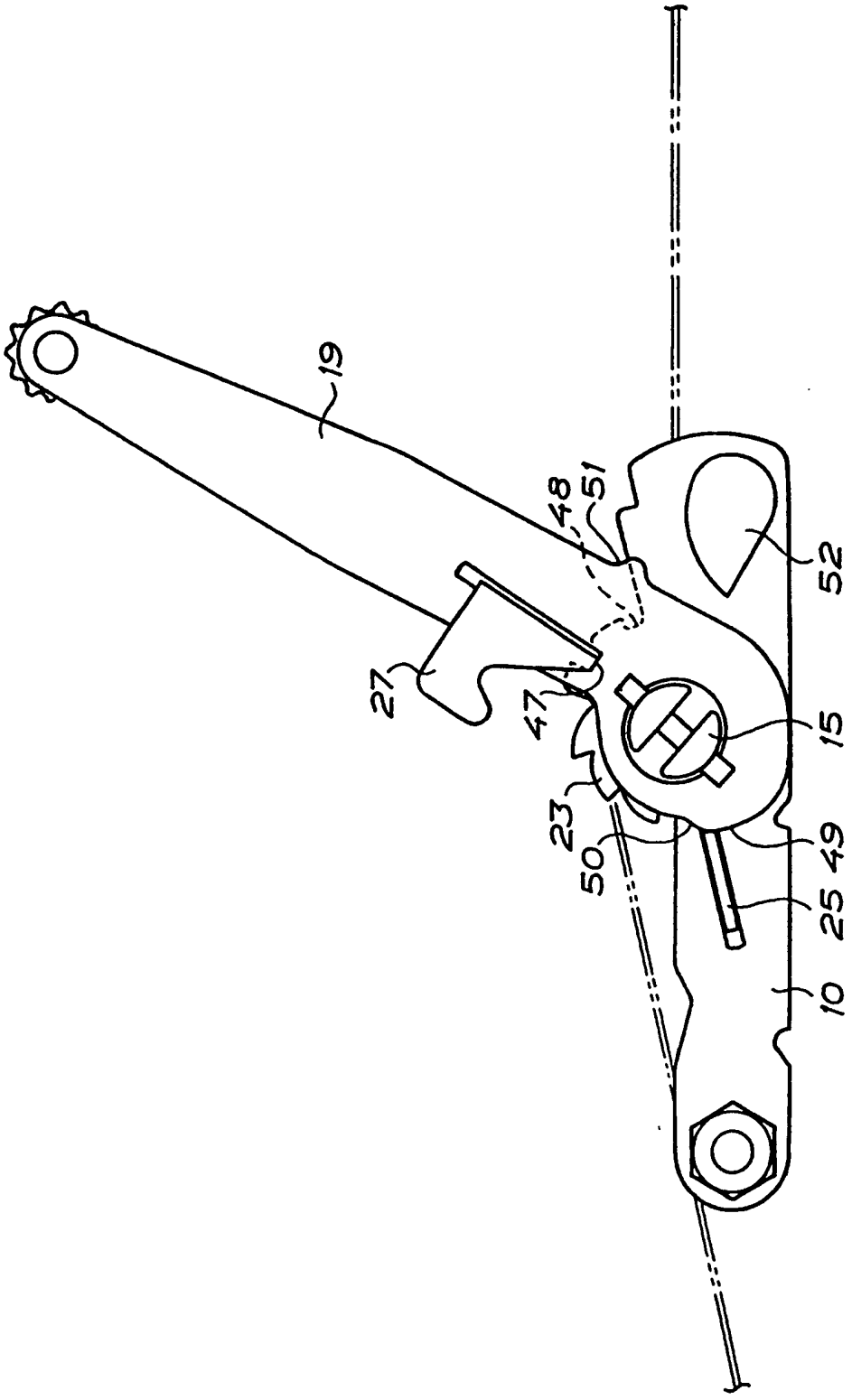

FIG. 5

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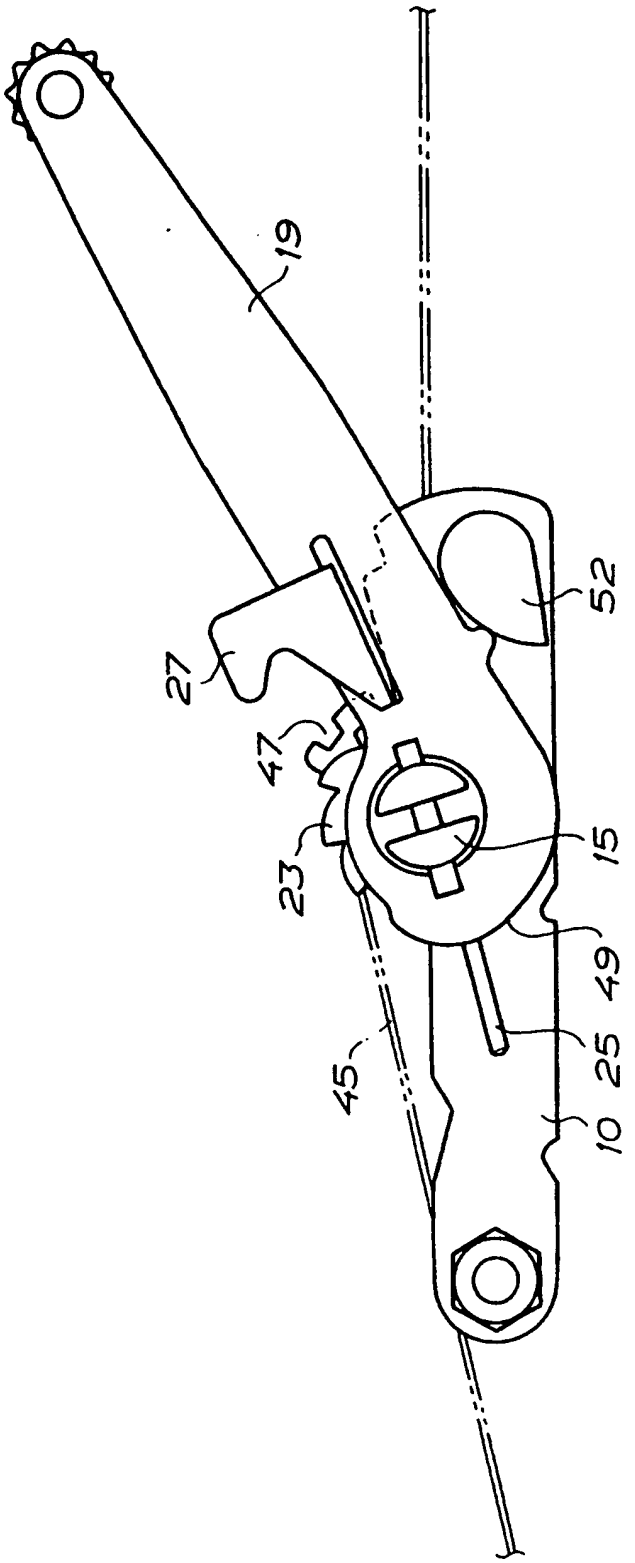

FIG. 6

SPECIFICATION

Strap tightener with strap lock

The invention relates to a strap tightener of the type used for tightening and securing straps for tying loads to trucks or similar vehicles and which comprises an element for fixedly anchoring the strap tightener, an operating arm pivotally mounted on the anchoring element, a strap drum mounted co-axially with the pivot axis, at least one ratchet-wheel connected to the drum for rotation therewith, a catch pawl mounted to the anchoring element and a driven pawl mounted to the operating arm, said pawls both being spring-biased to engage the ratchet-wheel, the operating arm being drivingly connected to the drum by means of the drive pawl and the ratchet-wheel when swung in one direction, and being disengaged from the drum when swung in the opposite direction, and a cam element on the operating arm for operating the catch pawl to the disengaged position against the spring bias when the operating arm is being swung in the driving direction beyond a predetermined angular position.

When the strap tightener is being used, the operating arm is pivoted back and forth to rotate the drum while the strap being tightened around the load and the strap being wound onto the drum. If it is desired to release the strap for unloading, the operating arm is moved to said predetermined angular position or beyond said angular position for releasing the drum by the catch pawl being moved to the disengaged position by the cam element such that the drum can rotate freely while the strap is being withdrawn from the drum.

Strap tighteners of the type referred to herein are shown and described in the Swedish patent specifications 7712242–2 (publication No. 408,695) and 7804911–1 (publication No. 412,557).

During transport of a load which is tied to a vehicle by means of straps which are tightened by means of strap tighteners of the type referred to herein, it may be necessary from time to time to re-adjust the strap, because the load may settle due to shaking when the vehicle is moving such that the strap will be more or less slack, which means that the holding of the load on the vehicle can be jeopardized. Then, the strap has to be re-tightened. In existing embodiments of the strap tightener, the strap is passed through a slot in the drum and thus will be wound onto the drum as double layers, which means that the drum has to receive a rather large amount of strap and due to the limited dimensions thereof will be full pretty soon such that it cannot receive more strap as is necessary for the re-tightening. Then, the operating arm is moved to or beyond said predetermined angular position so as to release the drum such that it can rotate freely and the wound strap can be pulled off the drum. The strap is then pulled through the slot such that the strap will engage closely the load. Then, the strap is re-tightened by pivoting the operating arm back and forth.

However, this manipulation of the strap tightener is not completely safe. When the load settles, one individual piece or the other thereof may have reached such a position that it falls off the vehicle when the strap is released in the strap tightener in the manner described in order that the strap will again be gripped and tightened.

The object of the invention is to improve the strap tightener such that the strap can be pulled off the drum when the strap is to be re-tightened, and can be gripped again without the necessity of loosening the load and incurring the risks involved therein.

In order to achieve this object the strap tightener of the invention has obtained the characteristics appearing from claim 1.

In order to explain the invention an embodiment thereof will be described in more detail below, reference being made to the accompanying drawings in which

Figure 1 is a perspective view of an embodiment of the strap tightener of the invention,

Figure 2 is an enlarged cross-sectional view of the strap drum with the strap wound thereon,

Figure 3 is an enlarged cross-sectional view of the strap lock,

Figure 4 is a side view of the strap tightener with the operating arm in a rest position,

Figure 5 is a side view of the strap tightener with the operating arm in the angular position for releasing the drum, and

Figure 6 is a side view of the strap tightener with the operating arm in the angular position for operating the strap lock.

The strap tightener shown comprises an anchoring element 10 which is made of metal sheet and forms two limbs 11 and a web 12 interconnecting the limbs. At one end of the anchoring element a cross bar 13 extends between the limbs, and a piece of strap for connecting the anchoring element to the platform or the like on which the strap tightener is to be used, can be attached to said bar. The anchoring element 10 can instead be attached by screws or the like extending through the element. Between the ends of the anchoring element there is rotatably mounted in apertures 14 a strap drum 15 comprising two parts 16 which are interconnected spaced from each other by means of cross pins 17 such that the drum 15 has a through axial slot 18. The strap to be tightened by means of the strap tightener when tying a load to the platform or the like can be inserted into said slot. Then, the strap will be pulled through

the slot to be engaged closely with the load before the strap will be tightened by means of the strap tightener.

An operating arm 19 is pivotally mounted to the drum 15 at one end thereof. This operating arm consists of two side elements 20 rigidly interconnected by means of a riveted cross piece 21 and a riveted handle 22 at the other end of the operating arm, said handle preferably being covered with rubber to provide an improved grip.

Two saw-toothed ratchet-wheels 23 are passed onto the drum 15 and are located between the limbs 11 of the anchoring element 10, which are located at the inner side of the ratchet-wheels, and the side elements 20 of the operating arm 19 which are located at the outer side of the ratchet-wheels. These two ratchet-wheels are connected with the drum 15 to be rotated therewith.

A drive pawl 24 is mounted to the operating arm 19 and catch pawl 25 is mounted to the anchoring element 10 for co-operation with the ratchet-wheels 23.

The drive pawl 24 comprises a U-shaped flat element so as to engage at the ends of the limbs thereof the two ratchet-wheels 23. The drive pawl 24 is guided in longitudinal slots 26 in the side elements 20 and at the outside of said elements the drive pawl forms flanges 27 angled perpendicularly to the rest of the drive pawl 24 towards the edge of the elements 20 which is adjacent the anchoring element 10. A tongue 28 formed by the drive pawl 24 extends through a support 29 on the cross piece 21, and between this support and the drive pawl 24 a helical compression spring 30 is engaged which surrounds the tongue 28 and biases the drive pawl 24 to emerge the ratchet-wheels 23. A handle element 31 formed by the drive pawl extends through an aperture 32 in the cross piece 21, and this handle element can be gripped with two fingers of the hand holding the handle 22 for displacement for the drive pawl 24 against the bias of the spring 30 for disengagement from the ratchet-wheels 23.

Also the catch pawl 25 comprises a flat U-shaped element and it is displaceably guided in slots 33 in the limbs 11 of the anchoring element 10. A tongue 34 on the catch pawl extends through a lug 35 angled from the web 12, and forms a support for a helical compression spring 36 which surrounds the tongue 34 and biases the catch pawl to engage the ratchet-wheels 23.

The operating arm 19 has a rest position in which it is adjacent the anchoring element 10 and extends along said element as shown in Fig. 4, and the operating arm is to be locked in this position while the catch pawl 25 at the same time is locked engaging the ratchet-wheels 23. For this purpose the flanges 27 are formed as hooks to engage the catch pawl 25 in the manner described in the Swedish patent specification 7804911-1 (publication No. 412, 557).

The limbs 11 of the anchoring element 10 project at the side of the drum 15 which is opposite to the cross bar 13, and a strap lock is mounted to the projecting limbs. This lock comprises a stationary jaw 37 arranged between the limbs 11, which forms a spacer between the projecting limb portions, and a pivoted jaw 38 which is fixedly connected to a shaft 39 rotatably mounted in the limbs, and is biased by means of a helical spring 40 forming two legs one of which 41 is attached to the shaft and the other one 42 engages a pin 43 on one limb 11 while the coiled portion surrounds the shaft 39. The spring 40 biases the pivoted jaw 38 for clockwise pivotal movement as seen in Fig. 3, for engagement for an abutment surface 44 on the jaw 38 with the stationary jaw 37. The engagement surface 44 can be knurled as shown herein or it can be shaped in another way so as to engage the strap extended between the jaws, which is shown at 45 in Fig. 3. E.g. the abutment surface 44 can be provided completely or partly with a material increasing the friction. The pivoted jaw 38 has a curved surface 46 to facilitate the insertion of the strap between the two jaws. The strap can be drawn from above downwards as seen in Fig. 3, i.e. it can be extended to the drum 15 without the strap lock interfering therewith, because the pivoted jaw 38 then will be swung away from the stationary jaw 37 against the bias of the spring 40. However, the strap will be effectively locked in the strap lock if the strap is pulled in the opposite direction, because the pivoted jaw 38 biased by the spring 40 then will move against the stationary jaw 37 providing a firm grip on the strap.

When the strap has been extended through the strap lock formed by the jaw 37 and 38, to the drum 15 and has been passed through the slot 18 of the drum, is to be tightened by means of the strap tightener described after the strap having been tightly applied against the load, the operating arm 19 is pivoted up and down as indicated by arrows in Fig. 1 the drive pawl 24 rotating the ratchet-wheels 23 and thus the drum 15 in clockwise direction as seen in Fig. 1, when the operating arm 19 is being swung upwards, while the catch pawl 25 will slide over the teeth of the ratchet-wheels 23 when rotated. Then, the strap will be wound onto the drum 15 as double layers as shown in Fig. 2. When the operating arm 19 is being swung downwards, rotation of the ratchet-wheels 23 is prevented by the catch pawl 25 engaging the teeth of the ratchet-wheel, while the drive pawl 24 slides over the teeth without carrying the ratchet-wheels along. When the strap is sufficiently tightened, the operating arm 19 is locked in the rest position thereof shown in Fig. 4 in order

that the operating arm will not swing outwards from the strap tightener if exposed to shaking movements as may be the case when the strap tightener is used for tying the load to a vehicle.

The operating arm 19 has two marked angular positions which are shown in Fig. 5 and 6, respectively. It can be arrested in these angular positions by means of the drive pawl 24 by the anchoring element 10 forming notches 47 and 48 for engagement of the drive pawl with the anchoring element. When the drive pawl engages the notch 47, the operating arm 19 being in the angular position of Fig. 5 in relation to the anchoring element 10, two cam elements 49 formed by the edge surfaces of the side elements 20 abutting the ends of the catch pawl 25 projecting at the outer side of the limbs 11 of the anchoring element 10, to maintain the catch pawl in a disengaged position in relation to the toothed ratchet-wheels 23 of the drum 15 against the bias of the compression spring 36. The cam elements 49 each form a ramp 50 in order that the catch pawl 25 will slide onto the cam element 49 when the drive pawl 24 is in a position close to the notches 47 and will snap into these notches under the bias of the spring 30 to be arrested in the position of Fig. 5. The notches 47 as well as the notches 48 have such a depth that the drive pawl 24 when engaging the notches, will be completely disengaged from the ratchet-wheels 23, and accordingly the drum is released for rotation in the angular position of the operating arm 19 shown in Fig. 5, such that the strap can be pulled off the drum when the strap tightener is in this adjusted position. It may be desired to do this in order to grip the strap again by means of the strap tightener for re-tightening the strap. However, in the position of Fig. 5 the strap is held by the strap lock comprising the jaws 37 and 38 so that the strap still retains the load tied by means of the strap. When the strap has been pulled off the drum 15 but still extends through the slot 18, the strap can be re-tightened in the manner previously described by pivoting the operating arm 19 back and forth in order to wind the strap onto the drum 15.

In order to release the tied load the engagement between the strap lock and the strap must be eliminated and this is achieved by continued swinging of the operating arm clockwise from the position in Fig. 5 to the position in Fig. 3 after the drive pawl 24 having been operated against the spring bias. The cam elements 49 are shaped such that the catch pawl 25 during this swinging movement will be maintained in the disengaged position. One side element 20 of the operating arm 19 forms a projection 51 which is adapted to engage an arm 52 fixedly attached to the shaft 39 and located at the outer side of one limb 11 of the anchoring element 10.

When the operating arm 19 arrives at the angular position defined by the engagement of the drive pawl 24 with the notch 48 as shown in Fig. 6, the pivoted jaw 38 will be swung counter-clockwise as seen in Fig. 3 against the bias of the spring 40 due to engagement between the projection 51 and the arm 52 so that the abutment surface 44 of the pivoted jaw 38 will be moved away from the strap 45 and thus the strap can pass unobstructedly through the strap lock between the jaws 37 and 38. Then, the strap lock between the jaws 37 and 38. Then, the strap can be withdrawn from the load for releasing same.

In the strap lock, the movement of the pivoted jaw 38 under the bias of the spring will be stopped by the jaw engaging the stationary jaw 37, but there may also be provided a separate abutment for the pivoted jaw so that it will be stopped in a position close to but spaced from the stationary jaw. The insertion of the strap through the strap lock will be facilitated by this arrangement.

The operative co-operation between the operating arm 19 and the arm 52 can be achieved in another manner than that shown herein e.g. by means of interengaging toothed segments on the pivoted jaw and the operating arm, respectively.

CLAIMS

1. A strap tightener comprising an element for fixedly anchoring the strap tightener, an operating arm pivotally mounted on the anchoring element, a strap drum mounted coaxially with the pivot axis, at least one ratchet-wheet connected to the drum for rotation therewith, a catch pawl mounted on the anchoring element, and a drive pawl mounted on the operating arm, said pawls both being spring-biased to engage the ratchet-wheet, the operating arm being drivingly connected to the drum by means of the drive pawl and the ratchet-wheel when swung in one direction, and being disengaged from the drum when swung in the opposite direction, and a cam element on the operating arm for operating the catch pawl to the disengaged position against the spring bias when the operating arm is being swung in the driving direction beyond a predetermined angular position characterized in that a strap lock for the strap extended to the drum is provided on the anchoring element, said strap lock having a spring-biased movable clamping jaw for locking the strap against withdrawal from the strap tightener, and in that the operating arm is arranged to engage operatively the jaw an continued swinging movement in the driving direction beyond a second predetermined angular position to operate the jaw to a disengaged position while releasing the strap in the strap lock for withdrawal from the strap tightener.

2. A strap tightener as claimed in Claim 1, in which the operating arm has marked pivoted positions in relation to the anchoring element corresponding to said angular positions.

3. A strap tightener as claimed in Claim 2, in which the operating arm can be arrested in relation to the anchoring element in said angular positions,

4. A strap tightener as claimed in Claim 3, in which the drive pawl is arranged to engage notches in the anchoring element in said angular positions while locking the operating arm to the anchoring element, and can be actuated manually for releasing the operating arm.

5. A strap tightener as claimed in any preceding Claim, in which the movable jaw is pivoted and is spring-biased to be swung towards and away from a stationary jaw mounted for co-operation therewith.

6. A strap tightener as claimed in Claim 5, in which the pivoted jaw is provided with means to be actuated by the operating arm for swinging the pivoted jaw to a disengaged position when the operating arm is being swung to said second position.

7. A strap tightener, substantially as hereinbefore described with reference to the accompanying drawings.

8. The features herein described, or their equivalents, in any patentably novel selection.

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